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TRANSLATIONS ON EASTERN EUROPE
SCIENTIFIC AFFAIRS
No. 556

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INTERNATIONAL AFFAIRS

GDR-USSR SCIENTIFIC COOPERATION DETAILED

Statistics Reported

East Berlin PRESSE-INFORMATIONEN in German 29 Apr 77 pp 4-6

[Text] One of the most important prerequisites for the reestablishment of the Academy of Sciences in Berlin after the overthrow of fascism was the support given by the Soviet Union. This was reflected in the order, issued on 1 July 1946, by Marshal Sokolovsky, head of the Soviet Military Administration and supreme commander of the Soviet Occupation Forces in Germany, providing for the reopening of the academy "for the purpose of using science to rebuild democratic Germany." From that time on contacts with Soviet science were steadily extended.

In the first years of the German Democratic Republic the Soviet Union's aid was crucial for the development of scientific life in our young workers and farmers state; later scientific-technological cooperation emerged by which both parties gave something to the other. In the last two decades this cooperation developed most successfully. The types of cooperation range from consultations and attendance at scientific congresses to research conducted on the principle of the division of labor and by means of coordinated plans and the efforts of joint collectives. All basic directions and important projects of cooperation in science and technology have been regulated in government agreements--currently there are more than 80 of these. Some 8,000 research projects, involving more than 15,000 scientists and engineers from the GDR, are handled in cooperation with the USSR.

In the period 1975/1976 more than 60 percent of the national research tasks assigned the GDR Academy of Science were accomplished in cooperation with facilities of the USSR Academy of Sciences.

A clear demonstration of this development is the constantly growing number of joint research projects. Some 200 facilities of the GDR Academy of Sciences are involved in joint projects carried on by 800 research institutes of the CEMA countries. As per the CEMA agreement "biophysics" alone, 30 of the total of 41 topics are worked on wholly or in cooperation by facilities of the academy. This international division of labor is a decisive aid in

raising the efficiency of research. At the same time new possibilities are provided for jointly utilizing results.

The further development of cooperation relations between the GDR and USSR Academies of Sciences is characterized by definite concentration on the speed-up of scientific-technological progress. This depends largely on the intensification of preparatory research. A conference of the presidents of the academies of sciences in the socialist countries, held in Moscow in February 1977, therefore directed the attention of all those present to the necessity for extending priority to the development of the construction of scientific appliances and the automation of scientific research.

The GDR is now one of the approximately 25 countries in the world actively involved in space research. Without interspace cooperation, led by the Soviet Union, space research would not be possible at all in our country. In April 1967 the first exchange of opinions took place in Moscow between scientists of the socialist countries, regarding cooperation in space. This resulted in a development which, looking back, may be subdivided into three stages.

The stage of preparatory experiments lasted from the mid-1960's to the late 1960's. The dress rehearsal for cooperation in this field was Cosmos 261, the first "sputnik of friendship", launched by the Soviet Union on 20 December 1968. Until the beginning of the 1970's the partner countries planned their own trials and brought them as their share to joint research. This period was characterized by the launching of the first interspace satellites, vertical MR-12 and M-100 rockets. In the early 1970's began the complex experiments: Ground, rocket and satellite methods were coupled. Intercosmos 15, launched on 19 June 1976, represented the first sputnik of a new generation of satellites described as automated universal orbital stations. The total of such enterprises now amounts to 41: 2 "Sputniks of Friendship" (Cosmos 261 and Cosmos 348), 16 satellites of the Intercosmos series, 3 vertical stratosphere research rockets and 19 meteorological rockets (6 of type MR-12 and 13 from the M-100 series) and now also Soyuz 22.

The launch of Soyuz 22 began a new stage in space cooperation by the CEMA countries. For the first time Soviet cosmonauts handled a complex group of devices from the GDR in space--the multispectral camera MKF-6 supplied by Jena's Carl Zeiss VEB. This was the first opportunity for the GDR Academy of Sciences to include manned space flight in experiments. This flight yielded data the production of which by traditional means would have required 80 years.

The Academies of Sciences of the USSR and the GDR have cooperated with many other sectors to prepare Soyuz 22. In the GDR more than 20 scientific institutions from the Academy and the competences of 9 ministries participated.

On the threshold of the third space decade cooperation is achieving quite a new level, due to the generous offer by the USSR to allow scientists and technicians from other socialist countries to participate in manned space flights. The respective tasks are planned for the period 1978-1983.

So far the institutes of the GDR Academy of Sciences have developed and produced more than 80 flight instruments and 50 related radar sets.

In interspace research we have four main directions. They concern investigations regarding space physics--especially the solar-terrestrial interrelations which are vital for life on earth, space communications (the Intersputnik communication satellite organization owned by nine socialist countries, now has a system of Molniya satellites and Intersputnik ground stations assuring telephone, teletype and television services for nearly 400 million citizens of the CEMA countries), space biology and space medicine.

In addition the national economies have obviously derived benefits from the experiences gained in space research. For example the weather satellite-picture receiving station WES-2, developed within the framework of interspace cooperation, has been operating reliably in many locations of our republic. Twenty-four of them were exported to other countries. We developed the Lyman alphaphotometer to study the high atmosphere. Subsequently a highly sensitive moisture meter was developed from that instrument, which is now used in many GDR factories to control production processes: In the Hennigsdorf Hans Beimler Locomotive Construction and Electrotechnical Plant VEB to measure moisture in the braking systems of diesel locomotives; in the Berlin-Oberschoeneweide Plant for Television Electronics VEB for the control of picture tubes in the drying process; in the meteorological service as hygrometers in weather stations. Telemetric subassemblies for space experiments allowing wireless transmission of signals are now in great demand as industrial telemetry systems. They are used, for example, in the Bannewitz Compressor Plant VEB and in the Dessau-Rosslau scientific-technological center for diesel engine construction, in cement factories, engine and turbine works.

Since 1963 cooperation has been close between the Academy of Sciences of the German Democratic Republic and the Academy of Medical Sciences of the Union of Soviet Socialist Republics. In 1976 the list of joint studies included 49 topics, 10 devoted to cardiovascular diseases, 14 to malignant tumors, 9 to infectious diseases, virology and immunology, 9 to genetics and molecular biology, 1 to nutrition, 2 to neurology and 1 to environmental control.

Very successful and enjoying general international recognition, for example, is the cooperation (including division of labor) which began 6 years ago to elucidate certain processes of hypertension by way of various animal models. This combines the work of the Berlin-Buch Central

Institute for Cardiac and Vascular Regulation Research and the Sukhumi Institute for Experimental Pathology and Therapy. The results were published in 1976, in 12 well known medical journals and lectures at international congresses, 7 of them in cooperation between GDR and USSR scientists. Altogether more than 50 joint contributions were sent to scientific journals in recent years touching on the field of cardiovascular research, more than 40 joint lectures and 2 joint monographs were prepared. Some of them are just now being printed.

In the field of occupational medicine also the close cooperation of scientists in the German Democratic Republic and the Soviet Union produced remarkable results. For example the provision of standardized scientific principles for the medical care of foundry workers produced a direct benefit for a segment of the working class still laboring in difficult conditions: From 1 January 1977, 22 standardized occupational hygienic standards took effect in the GDR and the USSR.

Together with experts from the Siberian Department of the USSR Academy of Sciences, members of the GDR Academy of Sciences also carry on joint work on 20 natural science-technological and sociological groups of topics. A total of 17 Siberian Institutes maintain close working contacts with 15 central institutions and institutes of the GDR Academy of Sciences. The spectrum of cooperation ranges from computer technology via isotope and radiation research to geological-geophysical expeditions.

The successful cooperation of the two research centers is documented by the exhibition "Scientific Siberia", which was inaugurated in Berlin on 27 April. This focuses on the description of outstanding research results from the 47 institutes of the Siberian Department, in which some 35,000 experts carry on basic and applied research. The results of the joint scientific work of the two partners are demonstrated in many exhibits. They include photographs taken in the course of the Soyuz-22 experiment to learn about the earth from space by means of the multispectral camera MKF-6.

Another example of successful cooperation between GDR research facilities with the Siberian Department of the Academy concerns computer technology. It is the development and use of large-scale computers type BESM-6 by experts of the Center for Computer Technology of the GDR Academy of Sciences and the Computer Center of the Siberian Department. The GDR Central Institute for Isotope and Radiation Research and the USSR Institute for Nuclear Physics also cooperate in the development and use of electron accelerators. In the course of this cooperation the Soviet partner supplied the GDR Central Institute with an electron accelerator which is already in use for basic research on so-called radiation initiated processes. The cooperation between the Institute for Anorganic Chemistry of the Siberian Department with several GDR research facilities is concerned with theoretical and experimental research into extraction processes to

obtain substances with a high degree of purity. The partners in this field also cooperate in the matter of extensive research on crystal and strata growth in the gas phase as well as investigations of the special qualities of liquid emulsion layers. Personnel of the Central Institute for Earth Physics at the GDR Academy of Sciences and the Institute for Geology and Geophysics of the Siberian Department carried on joint geological-geophysical expeditions from 1969-1975.

The decision on 14 main directions of scientific-technological cooperation in the period 1971-1975 to deal with areas of natural science and sociological basic research crucial for economic and social development initiated the transition to long-range planning of cooperation between the two academies. At the same time this represented an important prerequisite for the gradual interlocking of the two countries research potential. Now cooperation with the Union of Soviet Socialist Republics involves not only all central institutes and institutions of the Academy but also some 50 facilities of advanced schools and universities as well as industrial research departments.

Based on the conception of the long-range development of basic research in the German Democratic Republic through 1990 and on the documentation handed over by the Soviet side on main research trends in the field of natural and social sciences from 1976-1990 it was possible to lift to a higher level the long-range planning for scientific cooperation between the two academies in the period 1976-1980. This plan, the first concluded for a five-year plan period, includes 29 problems of basic research, which are subdivided into some 110 groups. At the same time the plan designates the coordinating institutes of both parties for each of the various groups.

Academy President Comments

East Berlin PRESSE-INFORMATIONEN in German 19 May 77 pp 3,4

[Article by Prof Dr Hermann Klare, president of the GDR Academy of Sciences, and Peter Jantzen, member of scientific staff: "Closer Cooperation With the USSR Academy of Sciences Speeds Up Research"]

[Text] The ninth party congress set out the programmatic challenge to expand basic research as the source of new knowledge on the inevitable connections in nature and society in the interest of long-range decisions for economic and scientific development. This demand is intended primarily to bring to bear the progress promoting influence and humanist nature of science.

While allowing for possible further precision and supplementation this conception of long-range development of basic research to 1990 and the plan of the Marxist-Leninist social sciences 1976-1980 establishes the mandatory strategy of research and the profile of basic research for the Academy of Sciences of the German Democratic Republic and the universities. To carry out this conception it will be necessary further to develop as planned the division of labor and cooperation between scientific facilities in our republic as well as international cooperation. At the same time the steady deepening and precise definition of international socialist research cooperation, especially with facilities of the USSR, represents an inherent element in the comprehensive process of socialist economic integration.

Long-Range Planning of Joint Work

The GDR and USSR Academies of Sciences have successfully cooperated for 20 years on a contractual basis. By establishing 14 main directions of scientific cooperation and more than 200 actual thematic agreements on important fields of research in natural and social sciences derived therefrom, we have advanced to the long-range planning of our cooperation. This was also an important precondition for the contribution of the academies to the gradual interlocking of the two countries research potential. The increasing extent of interlocking is demonstrated, for example, in the fact that by now some 70 percent of the national research tasks of the GDR Academy of Sciences are carried on in close cooperation with USSR research facilities. The scientific cooperation of the two academies has assumed organizational forms which, for many of the jointly tackled problems and topics, facilitate the effective specialization of efforts and exclude parallel and duplicated work.

In close cooperation scientists of the two academies, for example, gained fundamentally new knowledge of the synthesis, structure and qualities of polymer phosphates, especially in the field of crystalline ultraphosphates, a novel class of substances of great interest for laser technology. Based on joint theoretical, materials testing and technological investigations it was possible to develop steel wire-aluminum solid solutions, the technical and economic parameters of which raise expectations for successful use for heavy load bearing parts in machine and engine construction. Together we examined carbon and nitrogen isotopes in gases in order to ascertain the conditions for the emergence of gas deposits. This work is of the greatest economic importance because it assists the search for new gas deposits.

Especially effective and exemplary was cooperation in the interspace program. Extensive information was published on this cooperation in connection with the joint "Raduga" experiment carried out in the course of the flight of Soyuz 22 last fall. The contribution of the Academy of Sciences to the development of nuclear energy is to achieve a similarly close cooperation of immense economic importance.

The coordination of research by the two academies has also further developed in all sectors of social science and includes topical problems of the developed socialist society and planned subject-related research cooperation.

In addition to the direct effects of the division of labor in the cooperation in national research tasks such as the saving of cadres, time and material, the rational use of the scientific results achieved, the appropriate use or utilization of single available scientific equipment, and so on, many indirect effects are recorded which are not really measurable. By the systematic exchange of data between scientists of both sides it is possible, for example, to avoid errors, jump certain stages of research, transfer methods and indicate new lines of research. Another aspect is also quite essential: Within the range of Soviet research various fields are comprehensively studied which we in the GDR can actually only observe from a distance. By providing us with the relevant data here also, it is possible for us to concentrate our forces to selected key tasks within the framework of the division of labor within research cooperation.

Further to Raise the Efficiency of Research Cooperation

It goes without saying that the scientific facilities of the two academies also cooperate with the academies of sciences of the other socialist countries within the framework of the agreement on multilateral cooperation. Consequent upon the active participation of many GDR and USSR scientists both academies have contributed to the successful work of the international centers of the academies of sciences in Warsaw, Wroclaw, Minsk and Halle. Both academies have devoted special attention to the steady further development and perfection of multilateral cooperation, because it is a matter of principle that multilateral cooperation is the type of cooperation most appropriate to the socialist countries. This was reaffirmed in late February last, at the Moscow meeting of the presidents of the academies of sciences of the socialist countries. The conference closed with a binding agreement on multilateral cooperation (incorporating the division of labor) in the field of scientific device construction and the automation of scientific experiments.

The thematic plan of scientific cooperation in the period 1976-1980 provides for joint research or research coordination in the most important areas of the natural and social sciences, including such important fields as the theory and methods of optimizing the systems of the fuel-energy complex, solid body physics and material research, quantum electronics and laser spectroscopy, plasma physics, scientific apparatus construction, cybernetics and data processing, mathematics, anorganic, organic and physical chemistry, life sciences, philosophy, economics and history.

Both academies agree that, consonant with the standard achieved, the further development of research cooperation must primarily concentrate on raising efficiency. For the plan period 1976-1980 this means the further improvement of the extent of concentration and the extent of the division of labor. We will continue, purposefully and consistently, on the chosen path to increase the proportion of the division of labor, especially by concentrating on such problems and topics which lend themselves to far reaching specialization on the basis of the capacity available on both sides. This specialization obviously implies the responsible fulfillment of obligations incurred. At the same time we are gradually advancing the process of interlocking our efficient research potentials and, retaining the proven forms of bilateral cooperation, emphasizing multilateral cooperation. As a result we must improve the efficiency of the research collectives.

At the Moscow meeting between the general secretary of the CPSU and the presidents of the academies of sciences of the socialist countries in February last, L. I. Brezhnev said, among other remarks, that the cooperation of the socialist countries effects the multiplication not only the addition of their forces. Mindful of this statement the academies of sciences of the socialist countries will make new common efforts to utilize the certainly available reserves within the framework of the various forms of their multilateral and bilateral research cooperation.

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CSO: 2302

INTERNATIONAL AFFAIRS

BRIEFS

GDR-USSR IMMUNIZATION RESEARCH--Together with professional colleagues from the USSR, Jena scientists have arrived at new findings in connection with the immunization of monkeys with endogenous antibodies against streptococcus infections. These activities serve the exploration of the reactions of the immunity system of laboratory animals closest to human beings. For example, this experimental work has led to the interesting result that a distinct protective effect can be achieved for a limited time period with the tested antigens. Streptococci are responsible for causing diseases including scarlet fever, erysipelas, and acute nephritis. Participating in this cooperative research are experts from the Sukhumi Institute for Experimental Pathology and the Jena Central Institute for Microbiology and Experimental Therapy. Jena scientists also maintain research contacts with 17 other Soviet research centers, including the Institute for New Antibiotics and the Oncological Scientific Center. [Excerpts] [East Berlin BERLINER ZEITUNG in German 28 Jul 77 p 2]

CSO: 2302

EAST GERMANY

SCIENTISTS DISCUSS MERITS, DANGERS OF GENETIC ENGINEERING

East Berlin SPEKTRUM in German No 6, Jun 77 pp 2-4

[Text] The Division of Biosciences of the Academy of Sciences of the German Democratic Republic has prepared a significant statement of policy on the problem of modern genetic experiments which was released for publication at a plenary session of the Academy in April. The slightly abbreviated policy statement runs as follows:

The investigation of the molecular bases of life by the modern biosciences is enabling, to an increasing extent, profound interventions in the life processes of a very wide variety of organisms. The achievement of such possibilities for intervention and their utilization for society places a high responsibility on the scientists involved and on society. It is especially onerous if the interventions involve deoxyribonucleic acid (DNA), in whose structure is coded the genetic information which is at the base of the regulation and reproduction of life processes. It behooves us therefore to be concerned, with knowledge and wisdom, that this new knowledge and the possibilities resulting therefrom are implemented solely for the well-being of mankind. Man and his biotic environment should thereby also be protected against such negative consequences of experimental research and of the application of knowledge as might inadvertently occur. This requires the circumspect preparation and careful observance of trustworthy and collectively adequate safety criteria.

The results of molecular-genetic and molecular-biological research in recent years have opened the way to a conscious transformation of the material carriers of inheritance, i.e., to a technology of genetic manipulation (genetic engineering). Thus, in particular, methods have been developed for obtaining functional segments of the genetic information, so-called genes, for special fusion of such information-bearing segments with replicative carrier molecules, and for transferring such fusion products between various cells and organisms and are experiencing a continuous expansion and utilization for the clarification of the most disparate questions. These possibilities have again posed world-wide questions with respect to the scientist's responsibility for

the utilization of the results of his research and the careful maintenance of relevant safety measures required in such experiments. The Division of Biosciences of the Academy of Sciences of the German Democratic Republic has concerned itself with this type of problem in several conferences and to this purpose takes the following position: Methods developed in past years make it possible to obtain, combine and replicate DNA molecules with defined informational content as well as to introduce them into living beings of extremely varied taxonomic location (some of the necessary prerequisites and consequences of this are enumerated in the addendum to the policy statement). In this manner cells can be made to carry out genetic activities which do not originate from their own specific complement of genetic information.

Such reconstructed (recombinant) DNA molecules can be used, moreover

- for multiplying genes;
- for obtaining basic knowledge on viral, bacterial and animal genes as well as their products;
- for introducing animal genes into bacterial cells, for example for the industrial production of hormones and other metabolic products of animal cells;
- for introducing prokaryotic or animal genes into animal cells as an experimental model for the causal therapy of genetic defects and as a new fundamental method in animal breeding;
- for introducing prokaryotic or plant genes into plant cells as a new fundamental method in plant breeding;
- for selectively producing selected gene products of oncogenic viruses in order to enable their characterization and, for example, the development of specific antimetabolites.

The potential use possibilities permit the prognosis that these techniques--which are today designated internationally as "genetic engineering"--will be ever more broadly developed and utilized in the future. In spite of the worldwide ratification of the "Convention for outlawing the development, manufacture and storage of bacteriological (biological) and toxic weapons and for their destruction" it must not be overlooked that genetic engineering can also be misused for purposes which are counter to human health, peaceful development and the social advancement of mankind. In addition, together with a number of perceptible risks, the practical application of gene-fusion and gene-transfer techniques conceals also a series of risks whose details cannot currently all be foreseen. This has been repeatedly indicated in the past 2 years, and not only in the scientific literature. Special commissions to evaluate the risk have been instituted in the U.S., the USSR, Great Britain and other countries, which in many cases have submitted very concrete recommendations for safety measures. Corresponding guidelines in the U.S. were dismissed by the director of the National Institute of Health. In addition, some international bodies have been brought into being in the meantime which are involved with the problems of genetic engineering, including the Committee on Genetic Experiments founded during the 16th general assembly of the ICSU in October, 1976, and the Advisory Standing Committee on Recombinant DNA of the European Molecular Biology Organization.

Various danger points have been given special attention in the international discussions which have been held to date. One risk, for example, consists of the fact that *Escherichia coli* has been used exclusively till now for the cloning and enrichment of recombinant DNA molecules. Strains of this bacterium normally colonize the human intestinal tract. Therefore it cannot be excluded that DNA elements newly introduced into *Escherichia coli* bacteria could be widely disseminated in human populations and lead to health dangers.

A further risk results if so-called resistance factors, whose presence in the bacterial cell is linked with the appearance of multiple resistance to drugs, are used in the construction and transfer of such recombinant DNA molecules. In this case bacterial strains can be infected with foreign resistance factors (which were previously not present therein) or resistance factors can be formed which exhibit new combinations of resistance determinants, not found in nature, against antibiotics used in human medicine, veterinary medicine or stock raising. A third risk is linked with the coupling of DNA molecules or tumor virus DNA fragments to bacterial plasmids or other replicating units, since this results in the possibility of their uncontrolled spread by enterobacteria.

Finally, risks result if incompletely characterized animal DNA is coupled to plasmids or other replicating units. According to the oncogene hypothesis, DNA molecules of all vertebrates contain "oncogenes," which can effect a malignant transformation, and such oncogenes can be spread in uncontrolled fashion by enterobacteria.

The Division of Biosciences is therefore of the following understanding:

1. The demonstrated developments in the field of molecular biology and molecular genetics are opening up qualitatively new possibilities for the direct alteration of genetic information.
2. Genetic engineering is necessarily associated with numerous risks which, unlike the situation with usual bioscientific research, result not only from the misapplication of the research results but also from the research process itself. Under these conditions the important matter is to define the cognitive goals and conditions of molecular-biological and molecular-genetic research, as well as the utilization of the results obtained thereby, in terms of the ideological-moral principles and the practical requirements of developing socialistic society.
3. Scientists bear not only a heavy responsibility for setting the goals of their work and for the utilization by society of research results in the national economy and other areas. They are also responsible for seeing that man and his environment are not burdened by their experiments. Therefore, safety precautions for DNA fusion and transfer techniques, as well as for related genetic experiments, must be developed whose observance is regulated by the state in the same fashion as is experimental work with pathogenic germs, radioactive isotopes and virulent poisons.

4. These safety ordinances must be so conceived that on the one hand they guarantee the greatest possible safety for man and the environment but on the other hand do not interfere with the progress of bioscientific research.

5. The prerequisite for this is

- classification of the pertinent experiments into risk groups,
- the preparation of special safety regulations for the various risk groups and,
- the development of an effective control system.

(The Division of Biosciences submits detailed proposals in the policy statement, such as for legal regulations, which on the one hand guarantee the greatest possible safety for man and the environment but on the other hand do not retard the progress of bioscientific research).

Addendum

To the policy statement of the Division of Biosciences of the Academy of Sciences of the German Democratic Republic on problems of the "technology of novel genetic experiments." (Additional technical data).

Methods of genetic engineering developed in recent years make it possible to recombine DNA molecules in vitro, to replicate them in suitable host cells, and with their aid to introduce genetic information into organisms of widely varied taxonomic situation, between which no genetic exchange is possible in nature. By this means even the fundamental barrier between prokaryotes and eukaryotes can be surmounted in both directions. For example, the coupling of DNA from *Drosophila melanogaster* (fruit flies), *Xenopus laevis* (frog) or mammals with bacterial or bacteriophage DNA and the introduction of this recombinant DNA into the bacterium *E. coli* has been accomplished. Inversely, bacterial and bacteriophage DNA has been coupled with the DNA of the tumor virus SV 40 and introduced with the latter into mamalian (monkey) cells.

The prerequisites for the above were:

first, the development of methods for the specific fragmentation of DNA molecules and for the fusion of DNA fragments of widely varying origin. This was made possible by the isolation and characterization of the so-called restrictases (restriction endonucleases), which are formed by various bacterial species under the control of bacterial, plasmid* or bacteriophage genes. Restrictases recognize specific deoxyribonucleotide pair sequences. Many of them produce nonparallel double-strand breaks in these DNA sequences, giving rise to DNA fragments with so-called "sticky" ends, i.e., single-stranded

*Plasmids are extrachromosomal gene carriers present in certain bacterial species, i.e., DNA molecules capable of autonomous identical reduplication and which accordingly are "replicons."

ends with complementary bases. DNA molecules, even those of varied origin, which were split by one and the same restrictase yield DNA fragments having, in some cases, sticky ends so that these can be fused homologously or heterologously with one another. The DNA fragments which at first were linked only via the sticky ends can then be covalently bound by the subsequent action of polynucleotide ligase;

second, the availability of suitable vector DNA molecules having replicon* characteristics which--including the DNA fragments of foreign origin covalently bound to them--can replicate identically in suitable host cells. These are either bacterial plasmids, as for example resistance factors** or colicinogen plasmids, the DNA of suitable bacteriophage mutants, or the DNA of the oncogenic SN40 papovaviruses or of polyoma virus and their mutants;

third, the development of methods for introducing DNA molecules into suitable prokaryotic or eukaryotic cells. In this instance the major discovery is that the cell wall of E. coli (the host organism of the plasmids and bacteriophages mentioned above) can be made permeable to donor DNA;

fourth, the development of methods for detecting those cells, from among a surplus of treated cells, which have taken up recombinant DNA molecules. For example, those cells which have taken up heterologous DNA coupled to a resistance factor can be selected from an excess of bacteria possessing no donor DNA by the fact that they have acquired drug resistance from the uptake of the R factor.

With these techniques, DNA molecule fragments of the most varied origin can manifestly be fused together at will and introduced at least into bacteria and animal cells, but presumably also into plant cells. In addition to a number of predictable risks, the application of these techniques also conceals some risks whose details are currently not all recognizable.

One risk consists, for example, in the fact that E. coli is being used preferentially for the cloning and enrichment of recombinant DNA molecules. E. coli strains are normally present in, among other places, the human intestinal tract. Therefore, DNA elements newly introduced into E. coli could possibly be widely disseminated among human (and animal) populations and lead to unpredictable dangers to health. This risk is further magnified by the fact that colibacteria can release genetic material (and thus also recombinant DNA molecules introduced into them) to other bacterial species, including some human pathogens, by parasexual processes (bacterial conjugation and transduction).

* See preceding page footnote.

** Resistance (RO factors are plasmids that control an infectious resistance, i.e., one that is transferable from one bacterium to another, against one or simultaneously against several drugs (antibiotics, sulfonamides, etc.).

A further special risk arises if resistance factors are used in the construction and transfer of such recombinant DNA molecules. In this way, either directly or indirectly as a consequence of the parasexual processes mentioned above, bacterial strains can be infected with such resistance factors, which were previously not present therein, or R factors can be developed which exhibit new combinations of resistance determinants, not (previously) occurring under natural conditions, against antibiotics used in human medicine, veterinary medicine or nutritionally (in stock raising).

A further risk results if recombinant DNA molecules were to be introduced into animal cells (including human cells). In the present state of knowledge, only DNA molecules from tumor viruses must be used for this purpose, which could result in possibilities for an uncontrolled dissemination of such viruses and possibly also for their modification (such as broadening their host spectrum).

A fourth risk arises if DNA molecules from tumor viruses, or fragments thereof, are coupled to plasmids or other replicons, thereby resulting both in the possibility of their uncontrolled spread by enterobacteria and in the risk of possible formation of tumor-virus-specific proteins (possibly malignantly transforming proteins) by the correspondingly programmed bacteria.

Finally, risks result if unknown animal DNA is coupled to plasmids or other replicons.

8838

CSO: 2302

WEATHER FORECASTING SYSTEM PATENTED

Budapest HETFOI HIREK in Hungarian 1 Aug 77 p 5

[Excerpts] The National Patent Office has recently issued a patent to Mihaly David, engineer of the Szabolcs County council, for his system of weather prediction. Discussing his system, David says: "I was just reading books on geology when it occurred to me that perhaps the tidal effects, the phases of the moon could be responsible for everything. I believe that the tides are a unified force which affect land, sea and air. When I connect this with my comparative system--I won't go into detail since this is an invention--then it is possible to arrive at conclusions pertaining to the weather. My method is not prophecy--I stick to that--but forecasting.

My last year's prediction for the Lake Balaton region was 80-90 percent accurate. The rains and thunderstorms arrived on schedule, and temperatures were within plus or minus of 1-2 degrees of my prediction as well.

"My invention can be used in [crop?] production also. Another case where I hit the nail on the head has nothing to do with Hungary. I heard a radio broadcast on which it was reported what tremendous damage is caused in Asia by unexpected hurricanes. I wrote the radio station when the next hurricane was to be expected. I hit on the very day and part of South Vietnam where it [the hurricane] would come. I'd forgotten all about it when I read in the paper that there had been a hurricane on the day and place I predicted. Aside from this, I have been preparing Hungarian prognoses for an entire year. These are accurate with minor deviations. As for the month of August, there will be rain on 7 and 8, 18 and 19 and again on the 23rd and 24th. The mean temperature will be around 20 degrees. There will be a long Indian summer."

CSO: 2502

COMPUTER ENGINEERING EQUIPMENT SHOWN AT BUDAPEST FAIR

Budapest SZAMITASTECHNIKA in Hungarian Jun 77 pp 1, 2

[Article by Csanyi-Szabo: "Budapest International Fair, Spring 1977"]

[Text] On the basis of what was seen at this year's Budapest International Fair it can be stated as the general opinion that the foreground was occupied not by computer technology development but rather by manufacture and application. Naturally this does not mean that we could not see completely new equipment too. But visitors to the exhibits could get the impression of an emphasis according to which, since there already exists a broad selection of computer technology tools, the chief task is the economical, high quality manufacture of them and their rational application. This could be seen, for example, from the fact that the earlier basic equipment was exhibited in new system configurations, supplied with new software and made suitable for various purposes. Much equipment which figures earlier in the exhibit of some developmental or research institute appeared this year on the stands of the factories as newly manufactured or soon to be manufactured products.

Hungarian Exhibitors

Videoton appeared at the fair with several new products too. After the Leipzig Spring Fair and the Hannover Fair they now introduced at home also the VDDS display data station. As a result of its great configurational and functional flexibility this modern equipment, which has a pleasing form also, can be adapted to any alphanumeric application. Micro-programmed control guarantees a high degree of flexibility. A micro-program controls data flow between display and the central machine (or other apparatus, such as a line printer) with the use of a standard or unique interface as a result of which optional data transmission can be realized. The display can also be used for remote application via a suitable modem. The areas in which the new equipment can be used are: information display and editing; data input and processing; data transmission; interactive programming; and time-sharing processing. The special alphanumeric character and graphic symbol capacity increases the use possibilities. In the on-line and off-line operational mode the cassette or cartridge unit which can be built in

optionally makes possible the storage of large amounts of data (programs, formats, etc.). For the solution of data recording problems and to facilitate data processing the Videoton equipment offers a new intelligent data collection system, the Videoplex 2. With use of the Videoton 1010 system one can have preliminary data recording, ordering and supervision which facilitates the economical use of computers. The central unit of the Videoplex 2 can be linked to 32 working stations. In addition to the central unit and the working stations the system consists of a console display, an Izot 1370 mini-magnetic-disk unit, an Izot 5003 mini-magnetic-tape unit, a punch card reader and a line printer. In cooperation with Videoton and the ASZSZ, Szamki has developed the Videoton 1010 intelligent terminal family which makes it possible for owners of Videoton 1010 computers to have terminal links with the IBM or Honeywell 66 large computers. The members of the intelligent terminal family are the "IBM remote job entry link," the "Honeywell remote job entry link" and the "Honeywell concentrator." Representing another family, the VT 50 office computer, we can see the VT 54 business system which consists of an 8 K-word capacity VT 1005 central unit, keyboard, 2 cassette units, a line printer and a 5.1 M-byte capacity Izot 1370 magnetic disk unit. The representatives of VT said that this system could carry out data collection and data recording tasks in addition to business and control automation tasks. The capacity of the VT 50 systems will be greatly increased by the RPG II program language and magnetic disk file handling systems being introduced this year. We learned at the press conference held during the fair that computer technology products make up 43 percent of the total production of Videoton, to a value of about 2.5 billion forints. More than 70 VT systems are operating here at home and their equipment can be found in very many places from the Berlin airport to the Tyumen oil fields. Finally, good news for users: Videoton will carry out a 9 percent selective price reduction this year.

In addition to its display family Orion exhibited data transmission modems and test equipment. New items were the ADP 1500 alphanumeric display, the DME 028 display monitor unit and the PROM programmer. The members of the ADP alphanumeric display family can be used primarily in teletype type terminals but their systems technology solution makes possible applications going beyond the customary teletype functions. The DME 028 display monitor unit uses a line structure operating on a TV principle with so-called point raster or point illumination display. It can be used with any computer technology or other equipment where larger numbers of alphanumeric data and high resolution analog TV picture display are needed. The analog construction is suitable for emphasizing certain parts of text by changing the amplitude of the video signal. The PROM programmer can be used well in both operational and laboratory work with its broad scale of services.

It was also said at the exhibit that the chief market for the computer technology products of Orion is the GDR where there is a cooperation agreement with Robotron. This year the value of deliveries will be 1.5 million

rubles; Robotron builds Orion displays into its own equipment. Displays are shipped to the Soviet Union to a value of about half a million rubles per year; it is expected that there will be great interest in the new ADP 1500.

The Telephone Factory exhibited its already well known remote data processing systems. Its TAP-70 (ESZ 8570) [ESZR = Uniform Computer Technology System] type subscriber point is linked to an R-20 computer by telephone line through an ESZ 8002 modem, coupling unit and MO 51 type micro-computer multiplexor. The exhibit included two TAP-2 (ESZ 8502) subscriber points connected through a city telephone loop. In addition to TERTA modems and the ESZ 8421 remote multiplexor we could also see the MO 51 micro-computer which the SZKI developed and handed over to the Telephone Factory for manufacture.

The Electric Automatics Institute exhibited the PC 4000 business mini-computer, the Prepaline 110 M, the Floppymat D and a TPA 70 system which can be used for designing and testing printed circuit panels among other things. The system consists of a 16 K-word capacity TPA 70 computer, ESZ 7168 and VT 340 terminals, GS 71 graphic display, an Izot 1370 mini-disk, a DZM 180 matrix printer and a Calcomp 565 type graphing unit. The Telecommunications Research Institute informed the professional public of two systems. One is a TSM operational mode EKG processing system based on an R-10 and the other is the "Auter" design automation system. The Hungarian Optical Works developed its MPR 51/301 type punched tape data station within the framework of the MSZR system; it uses a new MP 51 type tape puncher and MR 301 tape reading devices. In addition to the already well known MF 3200 flexible disk storage we could see a new device, the dash code reader. The Budapest Radio Technology Factory exhibited a new data processing system consisting of its SLK-4 (ESZ 9006), LK-4 (ESZ 5094) and EK 9006 equipment, a TA-600 Terta terminal and a DZM 180 matrix printer. The new system has been tried out at the Trust of the Sugar Industry Enterprises, at the Great Plains Petroleum Industry Enterprise and the Hungarian Roller Bearings Works. The Electronic Metering Instruments Factory brought out Hunor 541, 552 and 553 model styled table calculators of a completely new design in addition to the earlier exhibited Inventomat 351 inventory keeping and evaluating equipment, the EMG 14894 thermal printer and the Hunor computer family. The FOK-GYEM cooperative introduced the public for the first time to a new version of its graphic digitalizing device which achieves a resolution of 0.1 millimeters. With the aid of the device graphic or pictorial information can be transformed into a form suitable for computer technology processing. The new graphic digitalizer is expected to be a sought after item on the domestic and foreign market. As official supplier for the Moscow Olympics the cooperative also exhibited computerized systems applicable in various branches of sports.

The Gamma Works won the grand prize of the Budapest International Fair for the data processing and display equipment introduced at the fair for use

with Anger type scintillation equipment. The MB-9101 type data processing system is based on a TPA/i mini-computer. Disk memory serves to record data; the processed scintigraphic picture appears simultaneously on a color picture screen and an oscilloscope.

The purpose of the exhibit of the Computer Technology Coordination Institute was to illustrate how computer technology developers and manufacturers could aid the successful application of computer technology tools. A TERTA TAP-70 (ESZ 8570) subscriber point -- like the system operating at the Telephone Factory stand -- was linked to an R-20 computer on which various programs were demonstrated. A VT 340 and a VTS 56 100 terminal operated in a time-sharing mode. We could see various applications of an MO 51 micro-computer developed by the SZKI [Computer Technology Coordination Institute] such as a color picture screen picture evaluation system for medical applications, or for display of geometric figures, and a TRANZIT 80 money changing and inventory control system.

On this occasion also the institutions and enterprises of the KSH [Central Statistics Office] appeared jointly at the usual place. The National Computer Technology Enterprise operated an information office and the International Computer Technology Education and Information Center (SZAMOK) showed its operations and the organization of its courses with the aid of a video tape recorder. The Remote Text Editor program developed by it was demonstrated with the aid of a terminal. The Statistical Publishing Enterprise acquainted the professional public with its books and other publications. Two systems were operating at the exhibit of the Computer Technology and Business Organization Enterprise. In one of them a VTS 56 100 terminal (supplied with an IBM 2780) was connected to an IBM 370/145 computer for remote job entry operation via a telephone line. In the other system an ESZ 7168 type VT terminal and, alternatively, an IRISCOPE 200 CII terminal connected to the IRIS-50 computer in Szombathely demonstrated an inventory maintenance program.

Foreign Exhibitors

New or further developed peripheral equipment attracted the most attention at the exhibit of the Soviet Union this time. The ESZ 6019 card reader differs from its predecessors primarily in regard to speed; the new machine reads 1,200 cards per minute as opposed to the earlier 600 cards per minute. The machine will be exported in 1978; NOTO-OSZV ordered 20 units at the time of the fair. It is expected that the ESZ 5025 magnetic tape storage and the ESZ 5525 control equipment will also be on the market next year. This equipment has a speed of 126 K-bytes per minutes.

At the Polish exhibit Metronex exhibited as a new item a display manufactured on the basis of a Stansaab license; this can be linked to any ESZR, Odra or IBM computer. In addition to being used domestically, this equipment will

be exported primarily to the Soviet Union. On the basis of a Logabox license they are manufacturing a DZM 180 (ESZ 7076) mosaic printer. One of their own developments is the Plx45D type floppy disk which is suitable for simultaneous data recording or reading on two flexible disks. The nominal capacity of the equipment is 12.8 M-bits. Mera-Elwro introduced table and pocket calculators. The table calculators have been manufactured for 4-5 years and manufacture of the pocket calculators began about one year ago. Members of both calculator families can be used for four basic operations and for percentage calculations; development for more complex operations is now under way.

The most interesting item at the GDR exhibit was the remote data transmission system for the R-40. As the representatives of Robotron and the BME said the system is being shown for the first time in Hungary; for demonstration purposes it was operated as a local system connected to the R-40 operating at Ganz-MAVAG. The system operated with a Rotam access method on the basis of the 1.6 version of the DOS/ESZ operational system. This system will be shown this year at both Brno and Plovdiv and it is being adapted at Ganz-MAVAG for material disposition, personnel records and control of NC machines. The new equipment of the GDR Zentronik enterprise included the Daro 1372 data recording machine, the Daro 1720 and the Daro 1750 automatic accounting machine introduced at the Budapest International Fair. The Daro 1372 can be used in areas where alphanumeric data must be recorded under office conditions and where data must be produced in a form suitable for data processing equipment. The modular construction of the Daro 1720 automatic accounting and billing equipment makes it possible to expand it with various types of peripherals (punched tape, floppy disks, magnetic stripe accounting cards) according to the needs of the user. The hardware configuration of the Daro 1750 electronic magnetic stripe automatic accounting equipment (central unit, 8 K-byte core storage, supplementary storage, floppy disk, mosaic printer, etc.) corresponds to the developmental trend characteristic of this class of equipment.

Among the many types of products of the Czechoslovak computer technology industry we could see the MEDA 42 TA type analog computer coupled to a BAK 5 T type xy graphic machine, the Consul 2111 type printer equipment (ESZ number 7181), the KPP 800 magnetic cassette memory unit, the already known ESZ 7054 digital plotting equipment and the Aritma 731 (ESZ 9014) data preparer. One could also see the Aritma 2030 (ESZ 9080) data preparer. The equipment carries out punch card perforation, verification and registration. The perforation and registration speed is 60 columns per second and the reading speed is 180 columns per second. The characteristics of the new equipment include the fact that data and program instructions can be stored in an internal memory. Representing the Romanian computer technology industry the Electronum enterprise brought to Budapest its Felix FC 16 and Felix FC 64 type billing and accounting machines. The Digitron enterprise from Yugoslavia exhibited pocket and table calculators. Bulgarian exhibitors introduced

Izot magnetic disk packs, Elka calculators, an Izot 1370 mini magnetic disk unit, an ESZ 5061 magnetic disk unit, Marica 41 and 41 D electronic typewriters and a control unit for the ESZ 5561 type 29 M-byte magnetic disk storage. This last item can be connected simultaneously to eight disk units. The data transmission speed is 312,500 bytes per second.

The Redifon firm exhibited for the first time at the Budapest International Fair although its products are not unknown in Hungary. (One each of their systems are in operation on an experimental basis at Chinoi, the SZAMTI of the Ministry of Labor Affairs and the Metallurgy and Machine Industry Institute of Industrial Management, Organization and Computer Technology.) The configuration of the system shown at the fair for demonstration purposes was as follows: a 64 K-byte central unit, a 9 channel 800 bit/inch magnetic tape unit, a 5 M-byte magnetic disk unit, four terminals, a 600 line/minute capacity line printer and a 300 card/minute capacity card reader. The most interesting new item from IBM was a 5100 type portable computer which can be operated anywhere where there are grounded network connections and a normal office environment. Prior computer technology expertise is not needed for its operation so it can be used by experts in any field. Its dimensions hardly exceed those of an electric typewriter and it weighs about 23 kilograms. Its central storage capacity is 16-32-48-64 K-bytes. A built-in picture screen shows input data and results, indicates errors and makes recommendations for their correction. By means of a magnetic tape unit which is also built in data and programs can be stored on easily handled cassettes. It can be connected to a printer to print results. Connected to a TV monitor several people at once can follow the work done on the computer. The computer can be connected as a final unit to a large computer and so its operator can have access to the data and programs of a large computer or can send local data for further processing on the central machine. Options include a plotter, graphic display, and a punch card unit which greatly expand its application possibilities. The swift and easy use is facilitated by complete programs stored on cassettes for the solution of common mathematical, statistical and financial tasks; the use of these requires no language knowledge. An interesting new item from Hewlett-Packard was the 9872 A plotter which operates connected to a 9825 A or 9831 A table calculator. The plotter, which is based on a micro-processor, can be used for four-color drawings and the selection of the various colored pencils takes place automatically according to the program provided. Thirty-eight different instructions are built into the apparatus; it should be especially useful in those drawings where the lines are difficult to distinguish from one another. The Canon firm exhibited a broad variety of table and pocket calculators from the simplest four operation calculators to more complex, multiple operation calculators with memories. Of the table calculators it is worth noting the Canola SX-320 type programmable set which has 40 memory units and 600 instructions and which can be expanded to 500 memory units and 5,000 instructions.

8984

CSO: 2500

BRIEFS

RADIATION SAFETY MEASURES--The extent to which specialists are concerned with safety measures is revealed by this year's session of the Hungarian Academy of Sciences at which physicists, chemists and those concerned with the technical sciences reported on the research results related to production of domestic atomic energy. For example, scientists of the Atomic Research Institute of Debrecen collaborated with researchers of an ore mining trust in evolving valuable processes for enriching the raw materials needed for nuclear power plants, for designating the sites at which drilling for uranium is to be conducted, for extracting uranium from coal or peat. The conference devoted considerable time to discussion of the training of specialists which will necessitate modification of the structure of technical training at both college and university because of the growing demand for operating level skills. The greatest emphasis was placed on issues of safety and radiation protection. Already worked out methods, norms and regulations which would be used in construction of the Paks nuclear power plant were discussed. In the course of construction, techniques which have provided maximum safety abroad will be taken into consideration: For example, a special concrete casing was evolved for covering the reactor housing. At the same time, the best foreign and Hungarian procedures of radiation biology research, dosimeters and instruments used in biosphere research will be utilized. A multi-stage security system will help eliminate breakdowns and prevent contamination of the atmosphere should such a breakdown nevertheless occur. [Budapest HAZAI TUDOSITASOK in Hungarian 1 Aug 77 p 5]

RAPID PROTEIN CONTENT DETERMINATION--The biophysical group of the Central Physics Research Institute has evolved a new analytical procedure which involves bombarding the sample with deuteron ions. These ions produce an exceptionally great variety of radiation in the atomic nuclei of the sample. With the aid of especially designed instruments, protons derived from nitrogen and protons derived from carbon are very clearly and efficiently selected from among these varieties of radiation. It is possible to determine the protein content of the sample accurately from the relationship of the strength of these two kinds of radiation. The procedure is exceptionally fast. It is typical of it that from a sample containing 1 - 2 percent nitrogen (5 - 10 percent protein) a quantity of a few tenths of a milligram can be analyzed in less than a second. Applications for the method are now being evolved. So far corn samples have been analyzed for the plant improving department of the Godollo University of Agriculture. The distribution of protein on cut kernels has also been charted. There is interest in using the system for analyzing animal feed mixes. It will probably result in great progress in grain improvement and in the investigation required in livestock breeding. [Budapest NEPSZABADSAG in Hungarian 9 Aug 77 p 10]

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